SBA

Business Basics

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Understanding Costs

A Self-Instructional Booklet
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KEEP THIS GUIDE SHEET -- FOR INSTRUCTOR'S USE ONLY

UNDERSTANDING COSTS
Instructor's Guide Sheet

This booklet contains:

1. Fixed and Variable Costs
2. Relationships Among Sales, Fixed Costs, Variable Costs, and Profit
3. The Breakeven Point
4. Impact of Less Gross Profit
5. Effects of Cost Increases
6. Estimate Sales and Profit
7. The Contribution Concept

Supplementary Instruction:

1. Have the client classify each major cost element of the business as either fixed or variable.

2. Develop an estimate of unit contribution or contribution percentage.

3. Determine the client's breakeven point based upon present cost and pricing structure.

4. Analyze the effects of changes in pricing structure or costs upon the breakeven structure.

5. Express breakeven in terms relevant to the client's business, such as percentage of capacity, occupancy rate, productive labor hours, and so on.

6. Prepare a general profit plan to determine the profit available at various sales levels and contribution percentages.

7. Analyze the effects of replacing fixed cost components with variable costs (such as converting salaried salespeople to commissioned salespeople) upon the client's breakeven point or profit objectives.

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INTRODUCTION

A new business machine can cut your bookkeeping expenses by at least $500 a year. The machine cost $6,000. Should you invest in such a machine for your office? The cost factors involved in making this decision to automate your bookkeeping point up two important aspects of costs -- costs are complex and they do affect your profit.

There is an old adage that says, "You have to spend money to make money." Within certain limits, this statement is true. But the questions remain: "How much can you afford to spend?" and "How much must you sell to justify the expense?" The answers to these questions, in particular the second one, are the essential basis of many business decisions.

Confusion

The subject of costs is often cluttered with confusing and conflicting statements. When two people talk of costs, they must be sure they are talking about the same thing. One may speak of <u>average</u> cost, while the other speaks of <u>total</u> cost. One may speak of <u>direct</u> costs, with no consideration of overhead, while the other speaks of <u>full</u> costs including every conceivable element of overhead.

Costs must be measured on a comparable basis in order to discuss or compare them intelligently. To evaluate costs properly, they must be expressed in terms that are <u>specific</u> and <u>relevant</u> to the situation at hand.

Booklet Objectives

In this booklet, you will learn to do the following:

- Express your costs in specific, meaningful terms.
- Understand how different costs are affected by changes in business activity.
- Establish a breakeven point for your business.
- Recognize the effect of price reductions on the sales volume required to meet your profit objectives.
- Determine the extra sales volume that must be generated to offset the effect of cost increases.

. Evaluate managerial decisions, such as the addition of employees or promotional expenses, in terms of the added sales required to offset the increased cost.

. Make a reasonably accurate forecast of profit for a coming period.

. Establish sales goals for a coming period that will be sufficient to cover all of your costs and produce a satisfactory level of profit to compensate you for your investment.

Basis of Other booklets

This booklet will also serve as a basis for other booklets that will deal more specifically with the problems involved in cost control and profit planning.

FIXED AND VARIABLE COSTS

Types of Costs

Costs can be viewed in several ways. Unfortunately, when people speak of costs, they often fail to be specific as to the type of costs. If you asked two people the apparently simple question, "How much does it cost to operate an automobile?," you would probably receive two different answers. This could happen even if both people drove the same year and model car the same distance and lived in the same community. Take a look at the following possible answers:

. "It costs $2,100 a year."

. "It costs 14 cents a mile."

As different as they appear, both answers could well be correct. However, each response failed to specify the type of cost being considered. Let us take a look at typical annual operating costs for an automobile to see how such an apparent contradiction can occur.

TABLE 1

AUTOMOBILE OPERATING COSTS

	$/Year	¢/Mile (based on 15,000 annual miles)
Depreciation	$ 600	4.0¢
Interest	300	2.0
Insurance	450	3.0
Maintenance	150	1.0
Registration, taxes	150	1.0
Gasoline	450	3.0
Total	$2,100	14.0¢

Based upon the above figures you could say, as one almost said, "The total cost is $2,100 a year." Or, as the other almost said, "The average cost is 14 cents a mile."

Both original answers were correct, provided that the annual mileage driven is 15,000. However, they were not specific.

When making business decisions, you must be specific. You can ill afford to make a wrong decision because the information you used was vague.

Cost Components

A more useful way of looking at the operating costs for an automobile is to separate the cost into two components:

- A fixed component that remains about the same regardless of mileage driven.
- A variable component that changes in direct proportion to the number of miles driven.

Fixed Component

In the case of operating an automobile, the fixed annual costs (from Table 1) would include the following:

Depreciation	$ 600 per year
Interest	300 per year
Insurance	450 per year
Maintenance	150 per year
Registration, taxes	150 per year
Total Fixed	$1,650 per year

All of these costs tend to remain about the same regardless of actual mileage driven. (Wide variations in mileage could affect some costs but, basically, a decision to drive another 1,000 or 2,000 miles would not affect any of these costs.)

Variable Component

The only remaining cost on Table 1 is gasoline. This represents the variable component, 3 cents per mile. Every extra mile driven will require an expenditure of 3 cents for gasoline. In other words, the total annual cost of gasoline will be in direct proportion to the number of miles driven.

Precise Cost Statement

A precise statement of automobile operating costs would be to state both the fixed and variable components as follows:

"It costs $1,650 per year plus 3 cents per mile."

The fixed component is $1,650 per year. The variable component is 3 cents per mile.

This precise statement can then be used to calculate the total annual operating cost at any mileage. For example, at 15,000 miles, the annual cost would be as follows:

Annual Cost = $1,650 + ($0.03 x mileage)

Annual Cost = $1,650 + ($0.03 x 15,000)

Annual Cost = $1,650 + $450

Annual Cost = $2,100

At 15,000 miles, the average cost per mile would be as follows:

Average Cost = Total Annual Cost ÷ Mileage

Average Cost = $2,100 ÷ 15,000

Average Cost = $0.14 per mile

At 20,000 miles, the total annual operating cost would be as follows:

Annual Cost = $1,650 + ($0.03 x mileage)

Annual Cost = $1,650 + ($0.03 x 20,000)

Annual Cost = $1,650 + $600

Annual Cost = $2,250

And the average cost would be calculated as follows:

Average Cost = Total Annual Cost ÷ Mileage

Average Cost = $2,250 ÷ 20,000

Average Cost = $0.1125 per mile

Owning vs. Operating

In the specific cost statement, "$1,650 per year plus 3 cents per mile," the fixed component, $1,650 per year, may be considered the cost of owning a car. The variable component, 3 cents per mile, may be considered the cost of operating the car.

Semi-Fixed or Semi-Variable Costs

In practice, many costs are neither totally fixed nor totally variable. For example, some elements of maintenance cost would probably remain the same whether you drove 15,000 or 20,000 miles annually. The cost of tuneups would remain fixed since you would probably have two tuneups per year in either case. However, oil additions and tire replacement tend to be variable since they would be more frequent if you drove more miles. Such costs, which include both fixed and variable elements, are often called semi-fixed or semi-variable.

Range

It is also true that many costs can only be considered fixed over a limited range. For example, if the depreciation is $600 per year on a car driven 15,000 miles, it would probably still be $600 if the car were driven 20,000 miles. However, if the same car were driven 30,000 miles, the depreciation would probably increase somewhat, but not in direct proportion to the actual miles driven.

NOTE: Cover the correct answers and write your answers on a separate piece of paper (or in the book). Check your answers and review weak areas. Do all the exercises the same way.

1. Which of the following is the most precise statement of the cost of owning and operating an automobile for one year?

   a. "It costs $2,400."
   b. "It costs 15 cents a mile."
   c. "It costs $2,000 + 4 cents a mile."

---

c. "It costs $2,000 + 4 cents a mile."

---

2. The statement, "It costs $2,400," could be true:

   a. regardless of the actual miles driven
   b. only at a certain number of annual miles

---

   b. only at a certain number of annual miles

---

3. The statement, "It costs $2,000 + 4 cents a mile," could be true:

   a. regardless of the actual miles driven
   b. only at a certain number of annual miles

---

   a. regardless of the actual miles driven

---

4. The statement, "It costs $2,000 + 4 cents a mile," includes both a _____ and a _____ cost component.

---

   fixed
   variable

---

5. The fixed component is:

   a. $2,000 per year
   b. 4 cents a mile

---

   a. $2,000 per year

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6. The variable component is:

   a. $2,000 per year
   b. 4 cents a mile

---

   b. 4 cents a mile

---

7. The fixed costs of driving an automobile are the (OWNERSHIP/OPERATING) costs.

   OWNERSHIP

---

8. The variable costs of driving an automobile are the _____ costs.

---

   operating

---

9. Some costs include both fixed and variable components. These are called _____ or _____ costs.

---

   semi-fixed
   semi-variable

---

10. If it costs $2,000 per year plus 4 cents a mile to drive a car, determine the total annual cost at 10,000 miles.
    $_____

   $2,400 [$2,000 + (10,000 x $0.04) = $2,000 + $400 = $2,400]

---

* * * * *

Business Application

The example of the cost of driving an automobile was used to illustrate the concept of fixed and variable costs. Now let us consider how these concepts would be applied to a small business environment.

Fixed and Variable Costs

Fixed costs are those that tend to remain the same in any time period despite changes in business activity.

Variable costs are those that tend to vary in direct proportion to changes in business activity.

Typical Costs

Fixed costs include items such as rent, utilities, salaries, insurance, property taxes, payroll taxes, office supplies, and depreciation that are generally unaffected by month-to-month variations in business activity. As you may have noticed, most of these costs are related to time. Rent is normally paid on a monthly basis, salaries are paid weekly or monthly, insurance coverage is provided for a specified time period, and so on.

Variable costs include items such as raw materials and supplies used in manufacturing, the cost of goods or services purchased for resale, or commissions based upon sales volume. As sales or production activities increase, these costs increase accordingly.

Recognizing Fixed and Variable Costs

Any cost that remains the same, in total dollars, at various levels of activity is a fixed cost. Examine the figures below:

Monthly Sales	Cost A
$2,000	$500
3,000	500
4,000	500

Cost A is $500 at all levels of sales. Therefore, it is a fixed cost.

Now examine Cost B below:

Monthly Sales	Cost A	Cost B
$2,000	$500	$200
3,000	500	300
4,000	500	400

Cost B, unlike Cost A, increases in direct proportion to increases in sales. Therefore, it is a variable cost.

Since variable costs tend to change in direct proportion to changes in activity, they are uniform when measured on a unit or percentage basis.

As you can see below, Cost B is 10.0% of sales at all levels of sales. Similarly, it is $0.20 per unit at all levels of sales or production.

Monthly Sales($)	Cost B ($)	Cost B (% Sales)	Sales or Production (units)	Cost B ($/unit)
$2,000	$200	10.0%	1,000	$0.20
3,000	300	10.0	1,500	0.20
4,000	400	10.0	2,000	0.20

* * * * *

1. Costs that tend to remain the same regardless of changes in sales or production volume are considered (FIXED/VARIABLE) costs.

FIXED

---

2. Costs that tend to vary as a direct result of changes in sales or production volume are considered _____ costs.

---

variable

---

3. Identify the fixed cost(s) below:

Sales (units)	Cost A	Cost B	Cost C
100	$100	$ 50	$100
200	200	100	100
300	300	150	100

C

---

4. Identify the variable cost(s) below:

Sales (units)	Cost A	Cost B	Cost C
100	$100	$ 50	$200
200	200	100	200
300	300	150	200

A, B

---

5. When measured as a percentage of sales or in dollars per unit, variable costs tend to:

   a. remain the same at all levels of activity
   b. change as the volume of sales or production changes

---

   a. remain the same at all levels of activity

---

6. When measured as a percentage of sales or in dollars per unit, fixed costs tend to:

   a. remain the same at all levels of activity
   b. change as the volume of sales or production changes

---

   b. change as the volume of sales or production changes

---

7. Cost A below is (FIXED/VARIABLE). Cost B is _____.

Sales (units)	Cost A ($/unit)	Cost B ($/unit)
1,000	$1.10	$2.00
2,000	1.10	1.00
3,000	1.10	0.67

VARIABLE
fixed

---

8. Cost A below is (FIXED/VARIABLE). Cost B is _____.

Sales ($)	Cost A (% Sales)	Cost B (% Sales)
$1,000	10.0%	50.0%
2,000	10.0	25.0
3,000	10.0	33.3

VARIABLE
fixed

---

* * * * *

Mixed Costs

Within any business, certain costs may be neither entirely fixed nor entirely variable. For example, the expense of supervisors' salaries would normally be considered fixed since they would tend to remain the same from week to week regardless of normal changes in activity. However, if a sharp sales drop were expected for an extended period, one or more supervisors might be laid off, reducing the salary expense. Similarly, a sharp increase in sales over an extended period might make it necessary to hire additional supervisors, increasing the salary cost.

Similarly, variable costs may not always vary in exact proportion to changes in sales volume. Your labor costs can increase when normal capacity is exceeded because of overtime costs. Your cost of inventory purchases might decrease at high volumes because you might be able to take advantage of quantity price discounts.

However, most costs can generally be classified as either fixed or variable within the range of normal changes in sales or production.

Time vs. Usage

One relatively easy way to identify fixed and variable costs in many cases is to consider whether or not the particular cost is based upon time or based upon volume of usage. Fixed costs are frequently time-based, while variable costs tend to be based upon usage. For a manufacturer, the cost of raw materials would normally depend upon production volume and would therefore be variable. The cost of leasing a building or equipment would normally be based upon a monthly or annual rental and therefore would be fixed. The salary of an accountant or supervisor would normally be time-based and would therefore be fixed. Sales commissions are normally based upon sales volume and would therefore be variable.

* * * * *

1. All costs can be classified absolutely as either fixed or variable. (TRUE/FALSE)

FALSE

---

2. Most costs can be classified as either fixed or variable within normal changes in sales or production volume. (TRUE/FALSE)

TRUE

---

3. Costs that tend to vary in direct proportion to the level of sales or production volume are (FIXED/VARIABLE).

VARIABLE

---

4. Costs that tend to remain the same without regard to the volume of sales or production are normally _____ costs.

---

fixed

---

5. Loan interest is an example of a (FIXED/VARIABLE) cost.

FIXED

---

6. The cost of dresses purchased for inventory by a women's clothing shop is an example of a (FIXED/VARIABLE) cost.

VARIABLE

---

7. On the list below, identify those costs that are usually fixed.

   a. equipment rental
   b. real estate taxes
   c. insurance
   d. raw materials

---

   a. equipment rental
   b. real estate taxes
   c. insurance

SALES, COST, AND PROFIT

Income Statement

One advantage of understanding the concept of fixed and variable costs is that it permits condensation of the income statement (operating statement or profit and loss statement) to a simplified format that is often convenient for analyzing the profit impact of such factors as cost increases, changes in market demand, or management decisions.

To see how an income statement is condensed to the fixed-variable format, refer to the income statements that appear as Table 2 and Table 3. Table 2 is an income statement for a typical retailing or wholesaling operation. Table 3 is an income statement for a typical manufacturing or service business. The statements on Tables 2 and 3 include a conventional report of sales and costs as well as a classification of each cost (or expense) item as either fixed or variable.

Retail/Wholesale Example

In the retail or wholesale example, Table 2, sales are $100,000 and cost of sales is $60,000. The $60,000 cost of sales has been entered in the variable cost column since it represents the business' cost of items purchased for resale to customers. Since this cost would tend to vary in direct proportion to changes in sales volume, it is variable.

TABLE 2

INCOME STATEMENT

RETAIL/WHOLESALE

		Variable Costs	Fixed Costs
Sales	$100,000		
Cost of Sales	60,000	$60,000	
Gross Profit	$ 40,000		
Salaries	$ 20,000		$20,000
Commissions	5,000	5,000	
Delivery Expense	1,000	1,000	
Rent	2,000		2,000
Heat, Light, Power	2,000		2,000
Maintenance	1,000		1,000
Advertising	3,000		3,000
Payroll Taxes	1,000		1,000
Employee Benefits	1,000		1,000
Miscellaneous	1,000		1,000
Total Expenses	$ 37,000	$66,000	$31,000
Net Profit	$ 3,000		

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Each expense item has also been classified as fixed or variable. Salaries, rent, utilities, maintenance, and so on are all classified as fixed, since they will probably remain the same despite changes in sales volume. Commissions, which normally depend upon sales volume, are classified as variable. Delivery expense, which would also tend to change in proportion to sales activity, is classified as variable.

Totals are shown for both fixed and variable costs. For fixed costs, the total is $31,000. For variable costs, the total is $66,000.

The sum of these costs, $97,000, equals the cost of sales, $60,000, plus total expenses of $37,000.

Manufacturing or Service Example

The income statement on Table 3 is shown in the conventional format with each element of cost and expense also classified as either fixed or variable.

TABLE 3

INCOME STATEMENT

MANUFACTURING/SERVICE

		Variable Costs	Fixed Costs
Sales	$100,000		
Cost of Sales			
Labor	20,000	$20,000	
Materials	10,000	10,000	
Factory Overhead	20,000		$20,000
Gross Profit	$ 50,000		
Selling, General, & Administrative Expense	45,000		45,000
Net Profit	$ 5,000	$30,000	$65,000

Cost of sales has been separated into three components as follows:

. Labor. Direct labor involved in the production process.

. Materials. Materials purchased from suppliers for use in the production process.

. Factory Overhead. This includes items such as rent and utilities costs for productive space; depreciation and

maintenance of machinery and equipment; salaries of production supervisors; and any materials used in production that do not become part of the finished product.

These costs have been classified as either fixed or variable as follows:

- Direct labor costs, which would usually increase or decrease with changes in the volume of activity, have been classified as variable.

- The cost of materials included in the finished product will tend to change as the volume of sales changes. Therefore, these costs have been classified as variable.

- Factory overhead costs tend to remain the same regardless of changes in the level of production. Therefore, these have been shown as fixed costs.

The only remaining cost shown in the example of the manufacturing or service income statement is selling, general, and administrative expense. In the example of Table 3, these costs have been classified entirely as fixed.

In some cases, a portion of these costs could be variable. For example, sales commissions included in selling, general, and administrative expense could depend upon sales activity and would therefore be variable. If so, the fixed and variable components of this expense should be classified separately. For purposes of this example, assume that all selling, general, and administrative expenses are fixed.

Total variable costs plus total fixed costs are $95,000 ($30,000 + $65,000). This equals the total of cost of sales, $50,000, plus selling, general, and administrative expense, $45,000.

Condensed Income Statements

A condensed income statement for the retail or wholesale example, Table 2, could now be shown as follows:

Sales	$100,000
- Variable Costs	66,000
- Fixed Costs	31,000
= Net Profit	$ 3,000

A condensed income statement for the manufacturing or service example, Table 3, could now be shown as follows:

Sales	$100,000
- Variable Costs	30,000
- Fixed Costs	65,000
= Net Profit	$ 5,000

* * * * *

1. Most business costs can be classified as either fixed or variable. (TRUE/FALSE)

TRUE

---

2. Costs that are neither entirely fixed nor entirely variable can be broken down into fixed and variable components. (TRUE/FALSE)

TRUE

---

3. The only variable costs are the costs of goods or services purchased for resale. (TRUE/FALSE)

FALSE (They can also include any other costs that tend to vary in proportion to sales activity.)

---

4. Which of the following statements is true?

   a. Sales - Fixed Costs = Net Profit or Loss

   b. Sales - Variable Costs = Net Profit or Loss

   c. Sales - Variable Costs - Fixed Costs = Net Profit or Loss

---

c. Sales - Variable Costs - Fixed Costs = Net Profit or Loss

---

5. If sales are $10,000, variable costs are $5,000, and fixed costs are $3,000, net income is a (PROFIT/LOSS) of $_____.

PROFIT
$2,000 ($10,000 - $5,000 - $3,000)

---

* * * * *

Net Profit or Loss at Various Sales Levels

Classification of costs as fixed or variable permits convenient determination of profit or loss at various levels of sales, as shown below. This example shows monthly profit or loss at different sales levels for a small business, selling one product, with the following cost structure:

Selling Price:	$1.00
Variable Cost:	$0.60/unit
Fixed Cost:	$1,600/month

Sales		Cost			
Units	Dollars	Variable	Fixed	Total	Profit/(Loss)
0	$ 0	$ 0	$1,600	$1,600	($1,600)
1,000	1,000	600	1,600	2,200	(1,200)
2,000	2,000	1,200	1,600	2,800	(800)
3,000	3,000	1,800	1,600	3,400	(400)
4,000	4,000	2,400	1,600	4,000	0
5,000	5,000	3,000	1,600	4,600	400

On the first line, you can see the loss that would be realized in a month with 0 unit sales.

Sales:	0 x $1.00		$ 0
Costs:			
	Variable: 0 x $0.60	$ 0	
	Fixed:	1,600	
Total Costs:			$1,600
Profit (Loss):			($1,600)

(Note: Amounts shown in parentheses indicate losses.)

The next line shows the profit (or loss) that the business would realize in a month with 1,000 unit sales.

Sales:	1,000 x $1.00		$1,000
Costs:			
	Variable: 1,000 x $0.60	$ 600	
	Fixed:	1,600	
Total Costs:			$2,200
Profit (Loss):			($1,200)

The sixth line shows profit (or loss) at monthly sales of 5,000 units.

Sales:	5,000 x $1.00		$5,000
Costs:			
	Variable: 5,000 x $0.60	$3,000	
	Fixed:	1,600	
Total Costs:			$4,600
Profit (Loss):			$ 400

* * * * *

Sales		Cost			
Units	Dollars	Variable	Fixed	Total	Profit/(Loss)
0	$ 0	$ 0	$1,600	$1,600	($1,600)
1,000	1,000	600	1,600	2,200	(1,200)
2,000	2,000	1,200	1,600	2,800	(800)
3,000	3,000	1,800	1,600	3,400	(400)
4,000	4,000	2,400	1,600	4,000	0
5,000	5,000	3,000	1,600	4,600	400
6,000					

Complete the table above to answer the following questions. In each case, enter your answers in the appropriate column.

1. At sales of 6,000 units at $1.00 per unit, the company's sales in dollars for the month would be $_____. (Enter your answer in the appropriate column on the table above.)

$6,000 (6,000 x $1.00) (You should have entered this amount in the column headed Dollars.)

---

2. Since the variable cost is $0.60 per unit, the variable cost of 6,000 unit sales would be $_____. (Enter your answer on the table.)

$3,600 (6,000 x $0.60) (You should have entered this amount in the column headed Variable.)

---

3. At 6,000 units per month, fixed costs would be $_____. (Enter your answer on the table.)

$1,600 (Fixed costs tend to remain the same despite changes in sales volume. You should have entered $1,600 in the column headed Fixed.)

---

4. At 6,000 units per month, total costs would be $_____. (Enter your answer on the table.)

$5,200 ($3,600 + $1,600) (You should have entered $5,200 in the column headed Total.)

---

5. Determine the company's profit or loss for the month on sales of 6,000 units. (Enter your answer on the table.)

$800 ($6,000 - $5,200) (You should have entered this amount in the column headed Profit/Loss.)

---

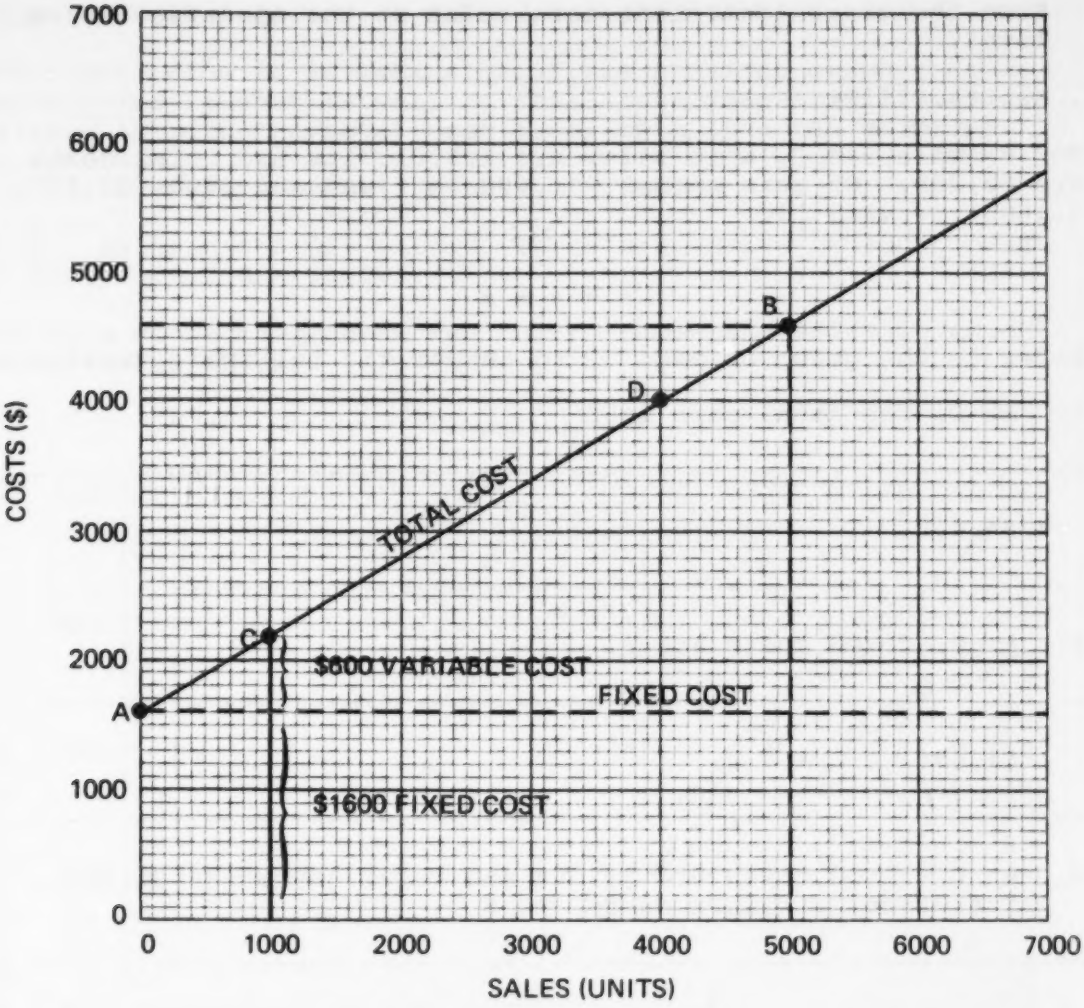
* * * * *

Graphic Representation

The costs shown in the example you have just seen also appear as a graph on page 23. The heavy diagonal line on the graph shows the total cost at various sales levels. The fixed cost at all sales levels is shown by the dashed line. The variable cost at any sales level is the difference between the total cost and the fixed cost.

Drawing the Graph

In order to draw a graph such as that shown on page 23, you first determine total costs at two levels of sales. For example, at A sales are 0 units, fixed costs are $1,600, and



variable costs are $0 (0 x $0.60). Therefore, total cost at A is $1,600 ($1,600 + $0).

At B, unit sales are 5,000 units. Total cost is as follows:

Fixed Cost	$1,600
+ Variable Cost (5,000 x $0.60)	3,000
= Total Cost	$4,600

The straight line between A and B represents total cost at any level of unit sales.

Since fixed costs at all levels of sales are $1,600, the dashed horizontal line at this level represents fixed costs. Variable costs at any level can then be determined as follows:

. From the graph, determine total cost at the specified sales level.

. Subtract fixed cost.

For example, at C, unit sales are 1,000 units and total costs are $2,200. Of this amount, $1,600 is fixed and $600 ($2,200 - $1,600) is variable.

* * * * *

Refer to the graph on page 23 to answer the following questions.

1. At D, the total cost is $_____.

$4,000

---

2. At D, fixed costs are $_____.

$1,600

---

3. At D, fixed costs are $1,600 and total costs are $4,000. Therefore, variable costs are $_____.

$2,400 ($4,000 - $1,600)

---

4. At sales of 3,000 units, total costs are $_____.

$3,400

---

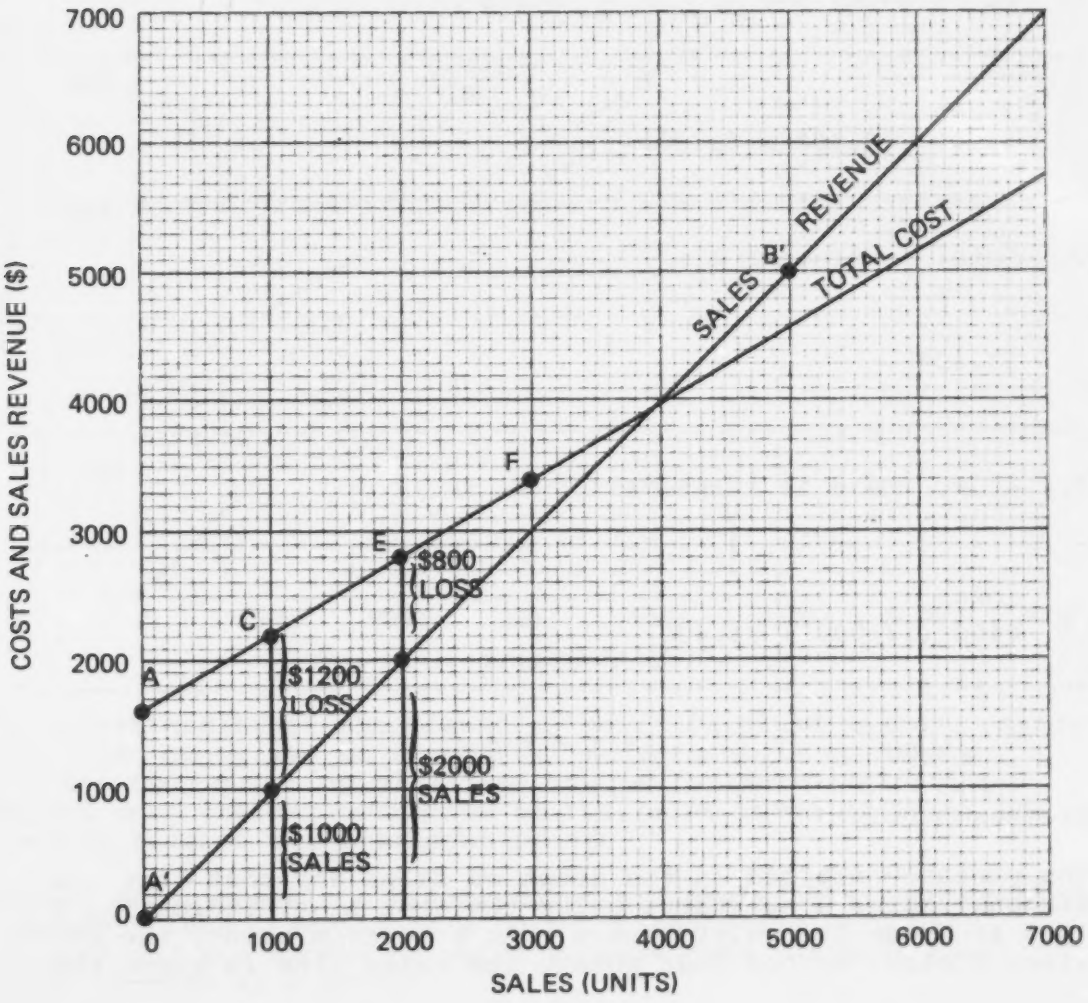
* * * * *

Graphic Representation -- Sales, Cost, and Profit

The graph below is an extension of the previous graph that shows sales revenue as well as total cost at all levels of sales. As with the total cost line, this line can be drawn by determining two points. For example, at A', unit sales are 0. Therefore, sales revenue is $0.

At B', sales are 5,000 units. Therefore, sales revenue would be $5,000 (5,000 x $1.00).

The line connecting these two points shows the sales revenue at any sales volume.



Knowing sales and total costs, you could then determine profit (or loss) at any level of sales.

For example, at C sales are 1,000 units or $1,000 (1,000 x $1.00). Total costs are $2,200. Therefore, there is a loss of $1,200 ($1,000 - $2,200) at C.

At E, sales are 2,000 units or $2,000 (2,000 x $1.00). Total costs are $2,800. Therefore, the loss is $800 ($2,000 - $2,800).

* * * * *

Refer to the graph on page 25 to answer the following questions.

1. At F, sales are _____ units or $_____.

3,000
$3,000 (3,000 x $1.00)

---

2. Total costs at F are $_____.

$3,400

---

3. At F, there is a (PROFIT/LOSS) of $_____.

LOSS
$400 ($3,000 - $3,400)

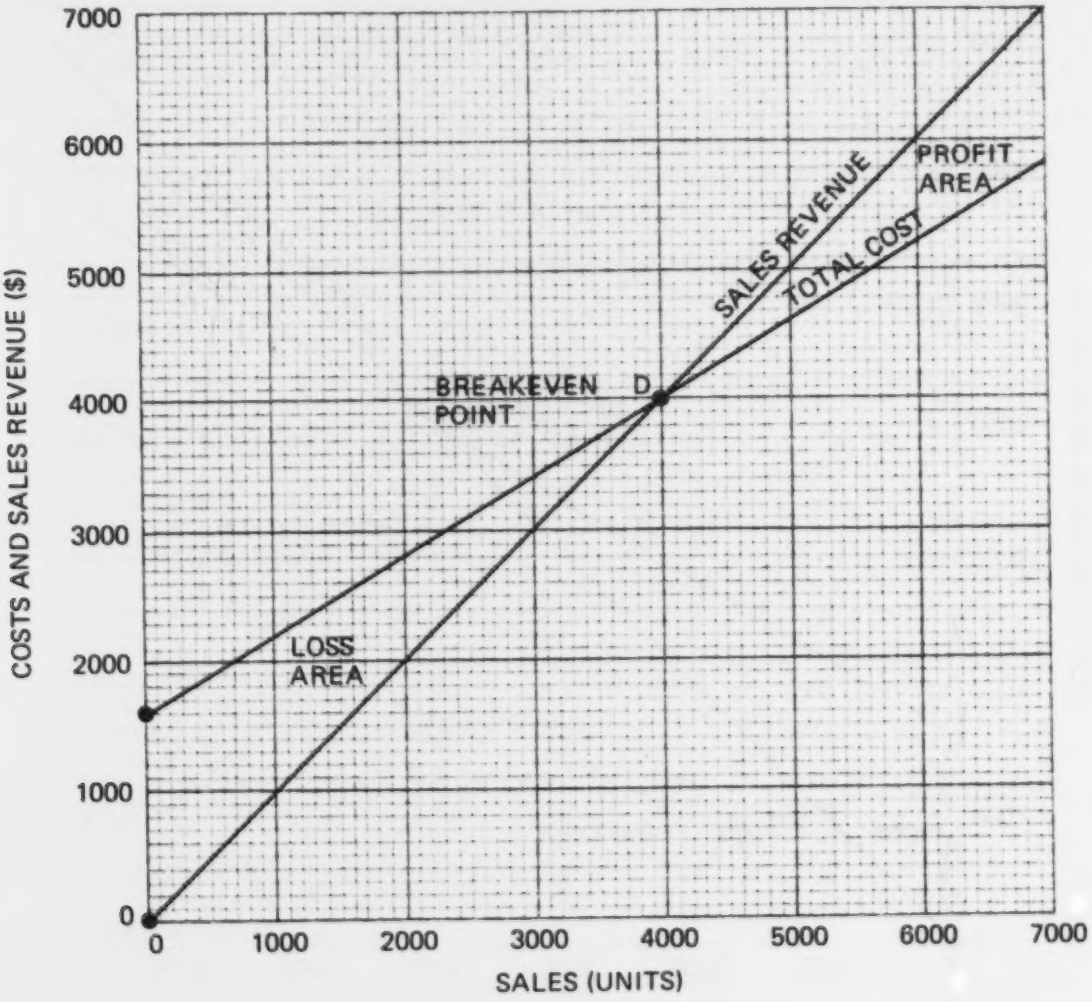
---

* * * * *

Breakeven Point

You probably noticed on the graph of sales and cost that the diagonal sales line starts <u>below</u> the cost line, indicating a <u>loss</u> at these low sales levels. At a certain point, the two lines cross. Beyond that point, the sales line is <u>above</u> the

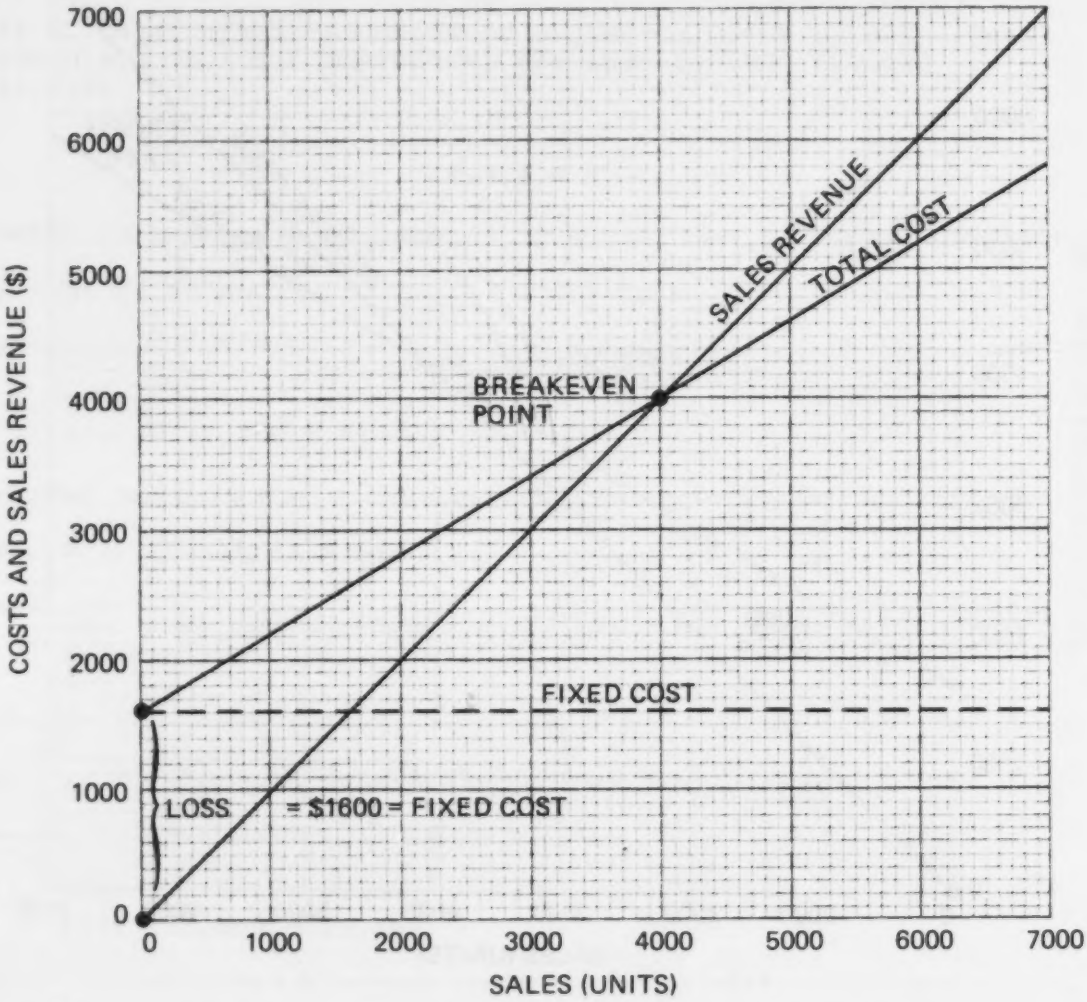
cost line, indicating a profit. The point where the two lines cross is called the breakeven point. This is marked D on the graph below. At this point, total sales revenue exactly equals total cost and there is neither a profit nor a loss.



An understanding of the breakeven point is often useful. Since the first objective of successful management is to make a profit, the operating plans and the performance evaluation depend upon the determination of the sales level at which the company reaches its breakeven point.

Before sales reach the breakeven point, every sale reduces the company's loss. Beyond this point, fixed costs have been covered and any excess of sales revenue over variable costs flows through as a profit.

Look at the graph below. At 0 sales, the business would suffer a loss of $1,600, exactly equal to fixed costs. As sales increase, this loss is progressively reduced until the breakeven point is reached. After the breakeven point, profit steadily increases.



* * * * *

1. At zero sales, the operating loss is equal to _____ costs.

---

fixed

---

2. The point at which total sales revenue equals total cost is the _____ point.

---

breakeven

---

3. At the breakeven point, sales equal:

   a. fixed costs
   b. variable costs
   c. total costs

---

c. total costs

---

4. The business shows no profit or loss at the _____ point.

---

breakeven

---

5. At sales below the breakeven point, the business shows a (PROFIT/LOSS).

LOSS

---

6. Beyond the breakeven point, profit steadily (INCREASES/ DECREASES) as sales increase.

INCREASES

---

* * * * *

THE CONTRIBUTION CONCEPT

Contribution

As you have seen graphically, a business with zero sales in a month will have a loss exactly equal to its fixed costs. Each unit sold contributes to a decrease in that loss. The amount of the contribution is the difference between the selling price and the variable costs. For example, with a unit selling price of $1.00 and a unit variable cost of $0.60, each unit sold contributes $0.40 ($1.00 - $0.60) toward decreasing the loss. One thousand unit sales contribute $400 (1,000 x $0.40) toward decreasing the loss.

Increasing sales will decrease the loss until the breakeven point is reached. Beyond that point, each unit of sales will contribute a profit equal to the difference between the selling price and the variable cost or, in our example, $0.40 ($1.00 - $0.60). One thousand unit sales would contribute $400 (1,000 x $0.40).

Look again at our example of sales, cost, and profit or loss for a business with fixed monthly costs of $1,600, a selling price of $1.00 per unit, and variable costs of $0.60 per unit.

Sales (units)	Contribution	Fixed Costs	Profit/ (Loss)	
0	$ 0	$1,600	($1,600)	
1,000	400	1,600	(1,200)	
2,000	800	1,600	(800)	
3,000	1,200	1,600	(400)	
4,000	1,600	1,600	0	(BREAKEVEN POINT)
5,000	2,000	1,600	400	
6,000	2,400	1,600	800	

Let us see how profit or loss can be determined at any sales level using the contribution concept.

At sales of 5,000 units and a contribution of $0.40 per unit, the total contribution would be $2,000 (5,000 x $0.40). From this amount, fixed costs of $1,600 are subtracted, resulting in a profit of $400 ($2,000 - $1,600).

Net Profit Calculations

Using the concept of fixed and variable costs, net profit can be determined as follows:

Sales - Variable Costs - Fixed Costs = Net Profit

The first two terms, "Sales - Variable Costs," represent the contribution from sales. Therefore, the expression can be rewritten as follows:

Contribution - Fixed Costs = Net Profit

* * * * *

1. At 0 unit sales, a business will have a net loss equal to its:

   a. monthly sales
   b. variable costs
   c. fixed costs

---

   c. fixed costs

---

2. Each unit sold reduces the loss until the _____ point is reached.

---

   breakeven

---

3. Above the breakeven point, each unit sold contributes to a (PROFIT/LOSS) for the period.

   PROFIT

---

4. The amount that each unit of sales reduces the loss or increases profit is called the _____ from each unit of sales.

---

contribution

---

5. The contribution from a unit of sales equals:

   a. the selling price minus fixed costs
   b. the selling price minus the unit variable cost
   c. the breakeven point

---

   b. the selling price minus the unit variable cost

---

6. An item has a selling price of $5.00 per unit. The variable cost of a unit is $3.50. The unit contribution is $_____.

   $1.50 ($5.00 - $3.50)

---

7. With a unit contribution of $1.50, sales of 1,000 units would reduce the loss (or increase profit) by $_____.

   $1,500 (1,000 x $1.50)

---

8. In the basic profit equation,

   Sales - Variable Costs - Fixed Costs = Net Profit or Loss,

   the term, Contribution, can be substituted for:

   a. Sales - Variable Costs
   b. Variable Costs - Fixed Costs
   c. Net Profit or Loss

---

   a. Sales - Variable Costs

---

9. A company has monthly sales of 10,000 units. The contribution from each unit is $2.00. Monthly fixed costs are $15,000. The contribution is $_____. Profit or loss for the month is $_____.

$20,000 (10,000 x $2.00)
$5,000 ($20,000 - $15,000)

---

* * * * *

Contribution Margin

So far, we have talked in terms of "unit contribution," the difference between the selling price and variable cost of each unit sold. In businesses with a variety of products, each with its own selling price and variable cost, it is usually more practical to use the "contribution margin," the contribution from each $1.00 of sales.

For example, if a business had total sales of $10,000 and total variable costs of $6,500, the contribution would be calculated as follows:

Sales	$10,000
- Variable Costs	6,500
= Contribution	$ 3,500

The contribution margin could then be calculated as follows:

Contribution ÷ Sales = Contribution Margin

$3,500 ÷ $10,000 = Contribution Margin

0.35 = Contribution Margin

The contribution margin could be expressed either as "35 cents per dollar of sales" or "35% of sales."

Once the contribution margin is known, the contribution from any level of sales can be determined as follows:

Sales x Contribution Margin = Contribution

For example, at sales of $20,000 and a contribution margin of 35%, the contribution would be calculated as follows:

Sales x Contribution Margin = Contribution

$20,000 x 0.35 = Contribution

$7,000 = Contribution

Calculating the Breakeven Point

Earlier, we saw how the breakeven point can be determined graphically. While the graphic approach simplifies understanding, it is often more convenient to calculate the breakeven point directly. This can be done rather simply by using the contribution concept.

Contribution - Fixed Costs = Net Profit

This can be rearranged as follows:

Contribution = Net Profit + Fixed Costs

By definition, net profit at the breakeven point is $0. Therefore, at the breakeven point:

Contribution = Fixed Costs

Since contribution equals sales multiplied by the contribution margin, we can now say, at the breakeven point:

Breakeven Sales x Contribution Margin = Fixed Costs, or

Breakeven Sales = Fixed Costs ÷ Contribution Margin

Therefore, a business with a contribution margin of $0.40 and monthly fixed costs of $2,000 would have a breakeven point as follows:

Breakeven Sales = Fixed Costs ÷ Contribution Margin

Breakeven Sales = $2,000 ÷ 0.40

Breakeven Sales = $5,000

* * * * *

1. The difference between the selling price and variable cost of one <u>unit</u> sale is called the _____.

---

unit contribution

---

2. An item with a selling price of $3.00 and a variable cost of $2.00 has a unit contribution of $_____.

$1.00 ($3.00 - $2.00)

---

3. The contribution from each dollar of sales is called the _____.

---

contribution margin

---

4. A business has sales of $5,000 and variable costs of $4,000. The contribution from these sales is $_____.

$1,000

---

5. The contribution margin is $_____ per dollar of sales or _____%.

$0.20 ($1,000 ÷ $5,000)
20%

---

6. With a contribution margin of 20% and sales of $10,000, the contribution would be $_____.

$2,000 ($10,000 x 0.20)

---

7. Complete the following:

Contribution - _____ = Net Profit or Loss

Fixed Costs

---

8. Complete the following:

Sales x _____ = Contribution

Contribution Margin

---

9. At the breakeven point, profit or loss equals $_____.

$0

---

10. At the breakeven point, (SALES/CONTRIBUTION) equals fixed costs.

CONTRIBUTION

---

11. Complete the following:

Breakeven Sales = Fixed Costs ÷ _____

Contribution Margin

---

12. How is the breakeven point calculated, given fixed costs and contribution margin?

Divide fixed costs by the contribution margin.

---

13. A business has monthly fixed costs of $3,000. The contribution margin is 30%. The breakeven point is $_____.

$10,000 ($3,000 ÷ $0.30)

---

14. Each dollar of sales above $10,000 will result in a profit of $_____.

$0.30

---

* * * * *

MANAGERIAL APPLICATIONS

Variety of Uses

The analysis techniques that you have learned in this booklet can be applied to a wide variety of managerial decisions and planning activities. In this section, we will consider several of the more common applications.

Pricing Actions

You are considering the profitability of cutting the price of your product from $1.00 to $0.90. The variable cost of the product is $0.60 and your monthly fixed costs are $3,000. You want to determine the number of additional units you must sell each month in order to break even at the lower price.

First, calculate your breakeven point at the current $1.00 selling price.

Unit Contribution = Selling Price - Unit Variable Cost

Unit Contribution = $1.00 - $0.60

Unit Contribution = $0.40

At a unit contribution of $0.40 and monthly fixed costs of $3,000, your present breakeven point is calculated as follows:

Breakeven Point = Monthly Fixed Costs ÷ Unit Contribution

Breakeven Point = $3,000 ÷ $0.40

Breakeven Point = 7,500 unit sales

At a 10% discount, the selling price is reduced to $0.90 and the variable cost remains $0.60. Therefore, the unit contribution is $0.30 ($0.90 - $0.60). The new breakeven point would be calculated as follows:

Breakeven Point = Monthly Fixed Costs ÷ Unit Contribution

Breakeven Point = $3,000 ÷ $0.30

Breakeven Point = 10,000 units

Therefore, a 10% price cut will increase your monthly break-even point by 2,500 units from its present level of 7,500 units to 10,000 units.

As a manager, you must decide whether or not the proposed 10% price increase will create sufficient extra sales demand to generate these 2,500 additional sales.

Fixed Cost Increases

In the coming year, you expect your fixed costs to increase by $1,400 per month. Your contribution margin is 35%. How large a sales increase will be required to provide sufficient contribution to cover the additional $1,400 in monthly fixed costs without reducing your net profit?

Sales Increase = Fixed Cost Increase ÷ Contribution Margin

Sales Increase = $1,400 ÷ 0.35

Sales Increase = $4,000 per month

In other words, you will have to produce an additional $4,000 in monthly sales to realize sufficient contribution to cover your $1,400 monthly increase in fixed costs.

Effect of Planned Expenditure

You are considering the possibility of placing an advertisement at a monthly cost of $200. You wish to determine the additional sales volume required at a 40% contribution margin to cover the cost of placing the advertisement each month.

Sales Increase = Fixed Cost Increase ÷ Contribution Margin

Sales Increase = $200 ÷ 0.40

Sales Increase = $500 per month

As a manager, you must decide whether or not the proposed advertisement at a monthly cost of $200 is likely to generate the additional $500 in sales required to cover the cost of the advertisement.

Profit Planning

You wish to forecast your monthly profit for the coming year assuming monthly sales of $5,000, fixed costs of $1,000 per month, and a contribution margin of 30%.

The contribution from $5,000 in monthly sales would be calculated as follows:

$$\text{Contribution} = \text{Sales} \times \text{Contribution Margin}$$

$$\text{Contribution} = \$5{,}000 \times 0.30$$

$$\text{Contribution} = \$1{,}500 \text{ per month}$$

The expected net profit can then be calculated as follows:

$$\text{Net Profit} = \text{Contribution} - \text{Fixed Costs}$$

$$\text{Net Profit} = \$1{,}500 - \$1{,}000$$

$$\text{Net Profit} = \$500 \text{ per month}$$

Establishing Sales Objectives

In the coming year, you expect your monthly fixed costs to be $7,000 and your contribution margin to be 40%. You feel that a monthly net profit of $3,000 would be sufficient to justify your investment in your business. You wish to calculate the monthly sales volume that would be required to cover your fixed cost and produce the desired $3,000 in net profit.

First, determine the required contribution:

$$\text{Contribution} - \text{Fixed Cost} = \text{Net Profit}$$

$$\text{Contribution} = \text{Net Profit} + \text{Fixed Cost}$$

$$\text{Contribution} = \$3{,}000 + \$7{,}000$$

$$\text{Contribution} = \$10{,}000$$

At a contribution margin of 40% and a required monthly contribution of $10,000, the sales needed to realize the monthly profit objective would be calculated as follows:

Required Sales x Contribution Margin = Required Contribution

Required Sales = Required Contribution ÷ Contribution Margin

Required Sales = $10,000 ÷ 0.40

Required Sales = $25,000 per month

* * * * *

1. If the current selling price of your product is $5.00 per unit and the variable cost is $3.00 per unit, the unit contribution is $_____.

$2.00 ($5.00 - $3.00)

---

2. You are planning to decrease the price by 20% from $5.00 to $4.00. Since your variable cost will still be $3.00, the unit contribution at the lower price will be $_____.

$1.00 ($4.00 - $3.00)

---

3. You are now selling 1,000 units per month. At the current unit contribution of $2.00, the monthly contribution is $_____.

$2,000 ($1,000 x $2.00)

---

4. How many monthly sales would be required to produce the same monthly contribution at a unit contribution of $1.00? _____

2,000 sales ($2,000 ÷ $1.00)

---

5. In the example that you have just completed, you have seen that realization of the same contribution, after reducing prices 20%, required a:

   a. 20% increase in sales
   b. doubling of sales
   c. tripling of sales

---

b. doubling of sales (from 1,000 units per month to 2,000 units per month)

---

6. To determine the extra sales realized to cover a fixed cost increase, you divide the amount of the increase by:

   a. your variable unit cost
   b. your present fixed cost
   c. your contribution margin

---

c. your contribution margin

---

7. You are expecting a monthly fixed cost increase of $1,000. Your contribution margin is 40%. What additional sales volume will be required to cover the fixed cost increase? $_____

$2,500 ($1,000 ÷ 0.40)

---

8. Your expected sales for the coming year are $10,000 per month. At a contribution margin of 35%, your monthly contribution is $_____.

$3,500 ($10,000 x 0.35)

---

9. If your monthly fixed costs are $2,000, the monthly net profit would be $_____.

$1,500 ($3,500 - $2,000)

---

10. You wish to establish a sales objective for the coming year. Your monthly fixed cost is $6,000 and you desire a net profit of $4,000. Therefore, you will need a monthly contribution from sales of $_____.

$10,000 ($6,000 + $4,000)

---

11. To calculate the sales volume required to realize $10,000 in contribution, you must divide the contribution requirement by your:

    a. contribution margin
    b. variable costs
    c. fixed costs

---

a. contribution margin

---

12. Your contribution margin is 20%. To realize $10,000 in contribution per month, your monthly sales must be $_____.

$50,000 ($10,000 ÷ 0.20)

---

* * * * *

SUMMARY

This module has been designed to increase your understanding of costs and the manner in which they behave as your level of business activity changes from time to time. With the knowledge you have gained in this module, you can separate any of the costs of your business into meaningful fixed and variable components. This separation permits easy determination of any cost element at any level of sales so that you can be guided in your managerial decisions and your planning processes. Separation of costs into fixed and variable components permits rapid analysis of many otherwise complex business problems.

Additionally, you have learned how to display costs graphically so that you can tell, at a glance, sales revenue, costs, and profit over a wide range of sales or production.

You have learned how to calculate a breakeven point for your business so that you will know what level of sales must be achieved each month before you break into the black.

You have learned how to apply the concepts of fixed and variable costs to a wide range of typical managerial decisions such as price changes, the effect of cost increases, and the effect of planned management actions.

You have also seen how these concepts can be applied to the establishment of sales objectives required to meet desired profit levels.

With the information you have learned in this module, you are ready to consider some of the more specific problems in cost control and profit planning that follow in other modules.

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